9. **DESIGN OF CLOSURE DIKE FOR EXISTING CHANNEL:** The location of the dike is shown on Figure 9.1 and is in an area where the channel diverges into a predominant flood channel (east side) and ebb channel (west side). Maximum depths in the dike area are around -12 feet NGVD and average approximately -7 feet NGVD. The total distance across the channel, measured from the +4 foot NGVD elevation on both sides of the channel, ranges from 1,650 feet to 1,800 feet. The final crest elevation of the dike will be +4.5 feet NGVD or approximately equal to the maximum elevation of the existing sand spit.

Construction of the dike will be accomplished by pumping material directly into the existing channel from the landward end of the new channel as depicted in Figure 9.1. The pipeline from the dredge to the discharge point would be routed along the existing sand spit with disposal beginning on the east side of the channel and proceeding west across the channel (Figure 9.1). The discharge point of the pipe would be initially placed at an elevation close to mean high water (+2.2 feet NGVD) in order to prevent material from washing back across the sand spit.

The volume of material required to construct the dike was based on a model developed by Creed and Olsen (1999) for a similar channel relocation project located in Port Royal Sound, which borders the northeast shoreline of Hilton Head Island, South Carolina. The simplistic model developed by Creed and Olsen predicted that the dredge would have to pump 160,000 cubic yards into the channel over a period of 3.5 days to close the channel. Peak flow velocities in the channel were comparable to the velocities in the existing Bogue Inlet channel and ranged from around 2 feet per second (fps) during neap tide conditions to 3.3 fps during spring tide conditions. Closure of the channel actually required four days and about 210,000 cubic yards or about 31% more than predicted. Based on the predicted and actual results of the channel closure off Hilton Head, the Creed and Olsen model appears to provide realistic results.

9.1. **Model Predictions of Dike Construction**.   Using the Creed and Olsen model, computations were carried out until the crest elevation of the dike reached an elevation equal 2.5 feet above NGVD or slightly above mean high water. Once the dike reaches this elevation, no flow would occur across the dike and the elevation of the dike could be raised to +4.5 feet NGVD without the interference of the tidal currents.   The total construction time determined from the application of the model was 6.5 days with the volume of material required to raise the dike to an elevation of +2.5 ft NGVD equal to 141,200 cubic yards. An additional 8,100 cubic yards would be needed to raise the crest elevation of the dike to +4.5 feet NGVD resulting in a total volume of 148,500 cubic yards. As noted above, the actual volume and time required to close the channel in Port Royal Sound was about 31% greater than predicted. Accordingly, the model results for the Bogue Inlet dike were increased by about 35% resulting in a design volume of 200,000 cubic yards. For the assumed dredge production rate of 900 cubic yards per hour, the total construction time for the dike would be 9.5 days.

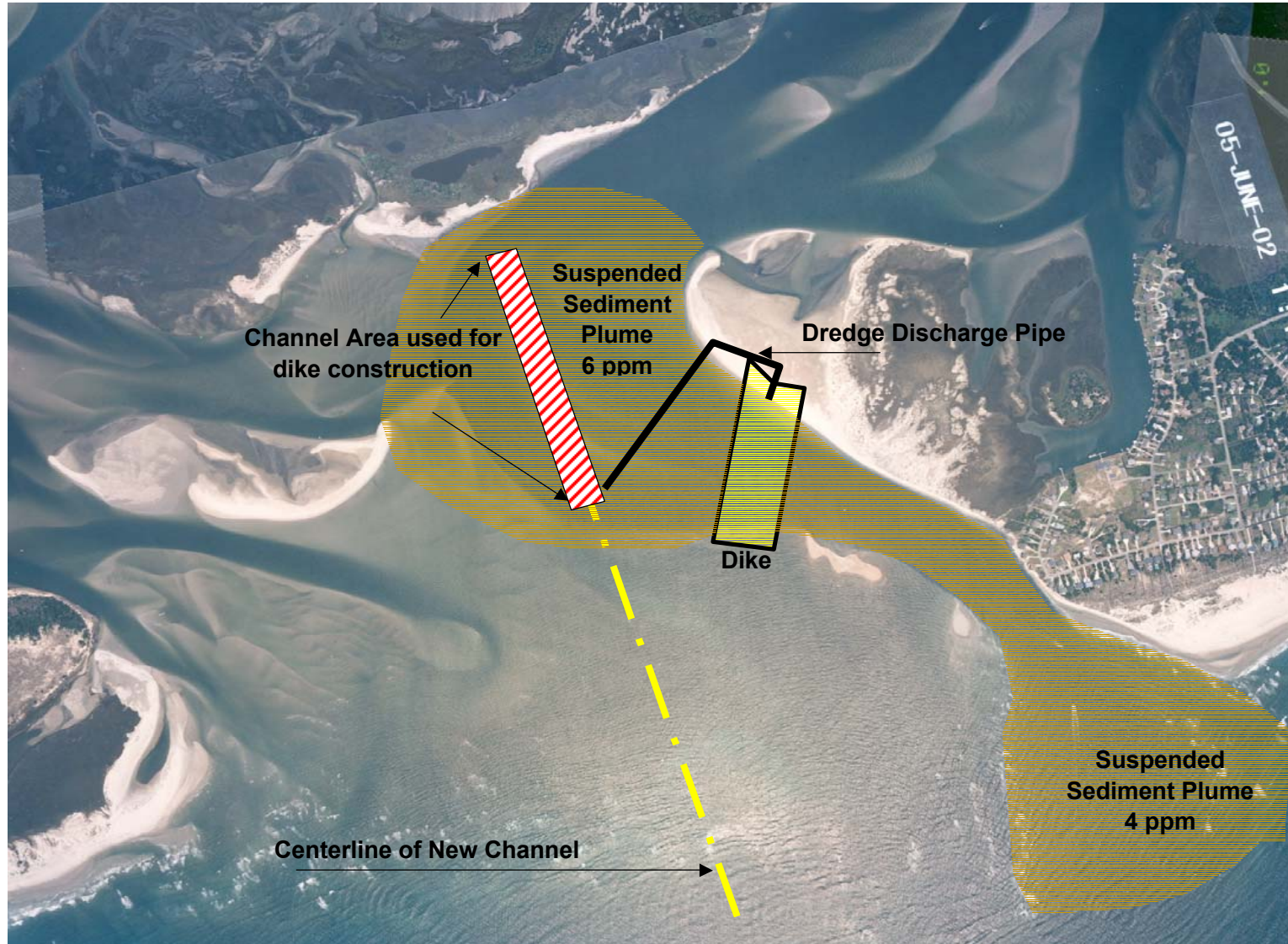9.2.   **Logistics of the Dike Construction**. Closure of the existing channel cannot start until the new channel has been advanced to the point that it begins to carry a significant

Figure 9.1 Channel Dike Location